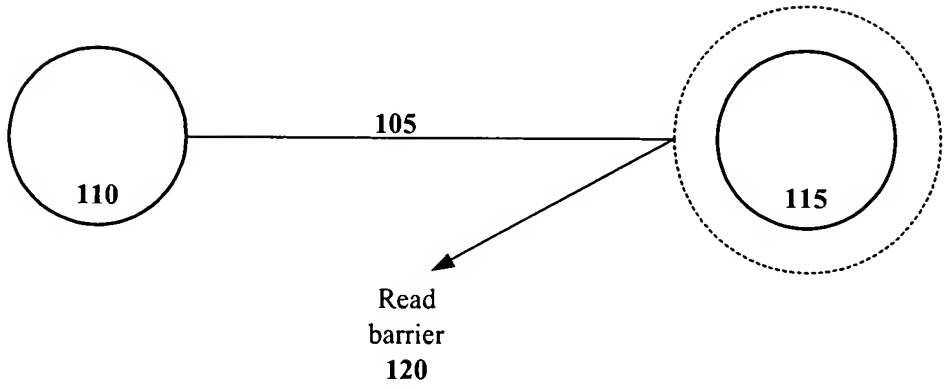
105
110
115
Read
barrier
120

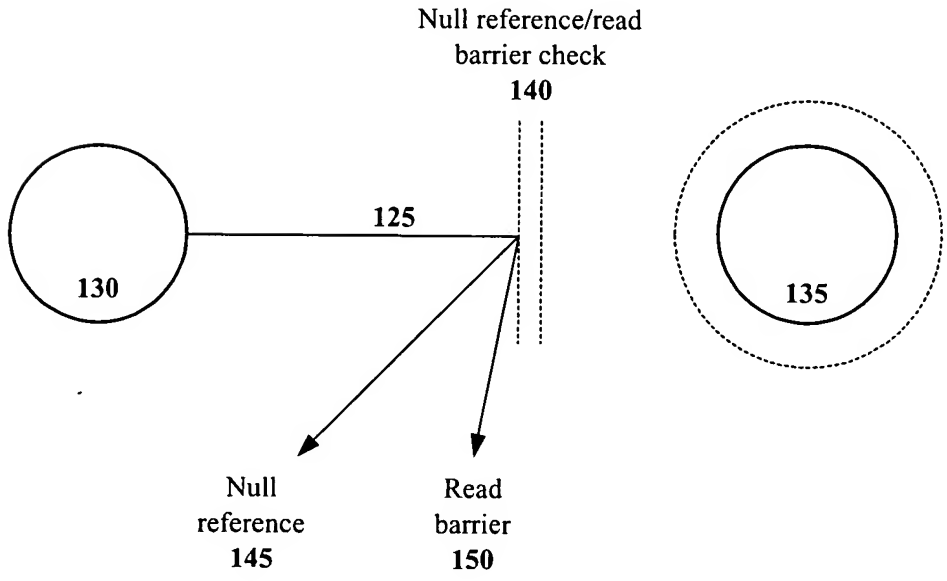
Null reference/read
barrier check
140
125
130
135
Null
reference
145
Read
barrier
150

Figure 1

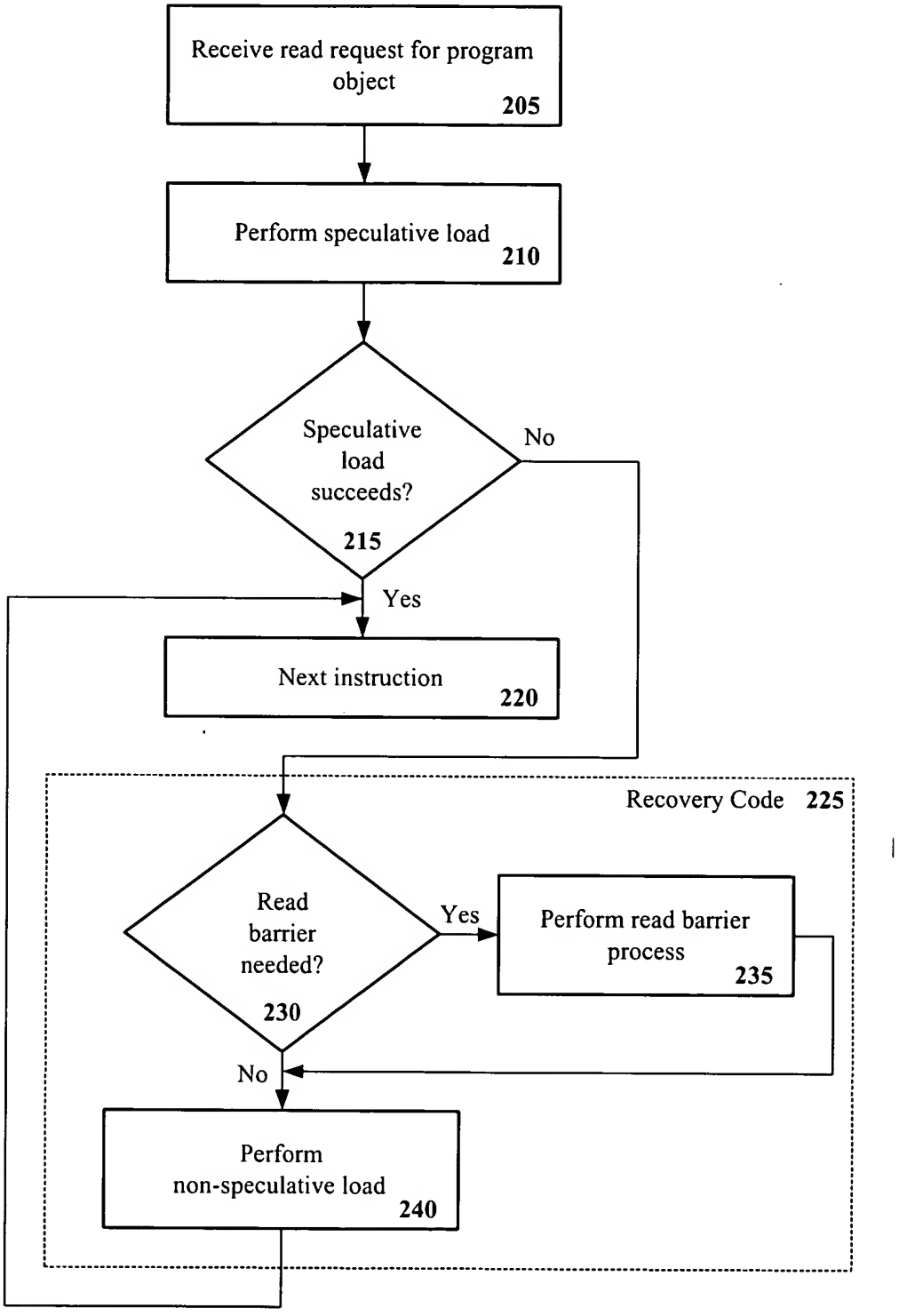
Receive read request for program object
205
Perform speculative load
210
Speculative load succeeds?
215
No
Yes
Next instruction
220
Recovery Code 225
Read barrier needed?
230
Yes
Perform read barrier process
235
No
Perform non-speculative load
240

Figure 2

```
305   // load p.x

310   I1:   t = add p, offset(x)
315   I2:   v = ld.s [t]
      . . .
320   I3:   chk.s v, RecoveryCode
325   NextInst:
      . . .

330   RecoveryCode:
335   I4:   (p1, p2) = tbit.nz t, 0
340   I5:   (pl) t = sub t, 1
345   I6:   (p1) read-barrier(t)
350   I7:   v = ld [t]
355   I8:   br NextInst
```

Figure 3

```
405   // load p.x

410   I1:    t = add p, offset(x)
415   I2:    v = ld.s [t]
      . . .
420   I3: chk.s v, RecoveryCode
425   NextInst:
      . . .

430   RecoveryCode:
435   I4:    (p1, p2) = cmp.eq t, offset(x)
440   I5:    (p1) br RaiseNullPointerException
445   I6:    (p3, p4) = tbit.nz t, 0
450   I7:    (p3) t = sub t, 1
455   I8:    (p3) read-barrier(t)
460   I9:    v = ld [t]
465   I10:   br NextInst
```

Figure 4

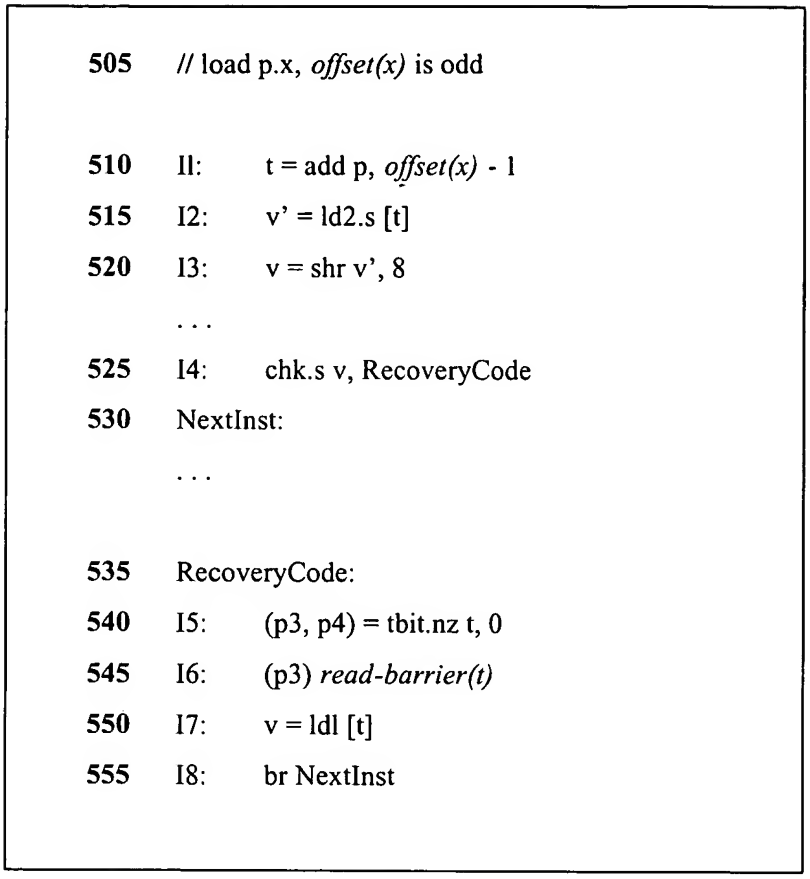
505 // load p.x, offset(x) is odd
510 I1: t = add p, offset(x) - 1
515 I2: v' = ld2.s [t]
520 I3: v = shr v', 8
. . .
525 I4: chk.s v, RecoveryCode
530 NextInst:
. . .
535 RecoveryCode:
540 I5: (p3, p4) = tbit.nz t, 0
545 I6: (p3) read-barrier(t)
550 I7: v = ldl [t]
555 I8: br NextInst

Figure 5

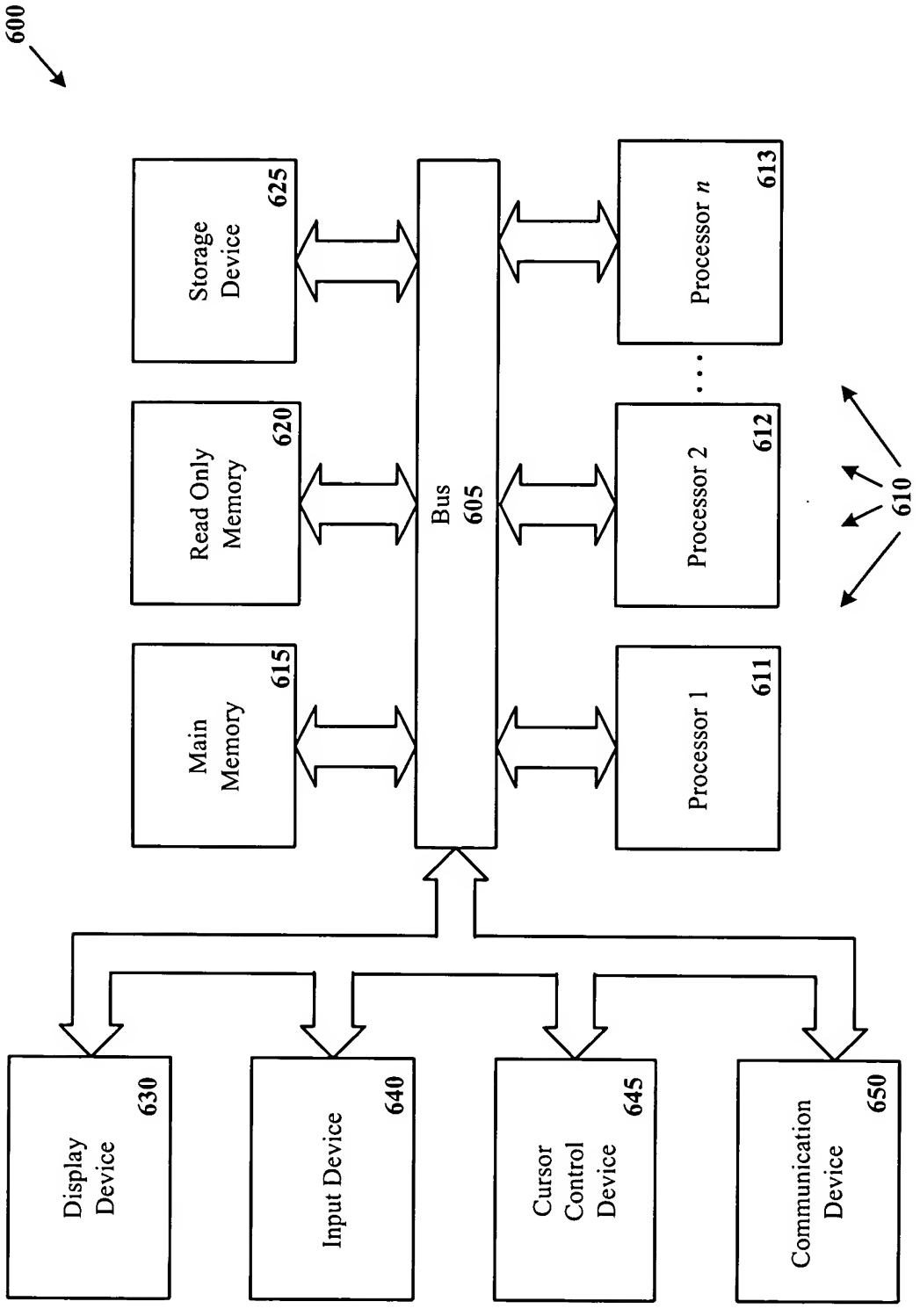
600
Storage Device
625
Read Only Memory
620
Main Memory
615
Bus
605
Processor n
613
Processor 2
612
Processor 1
611
610
Display Device
630
Input Device
640
Cursor Control Device
645
Communication Device
650

Figure 6